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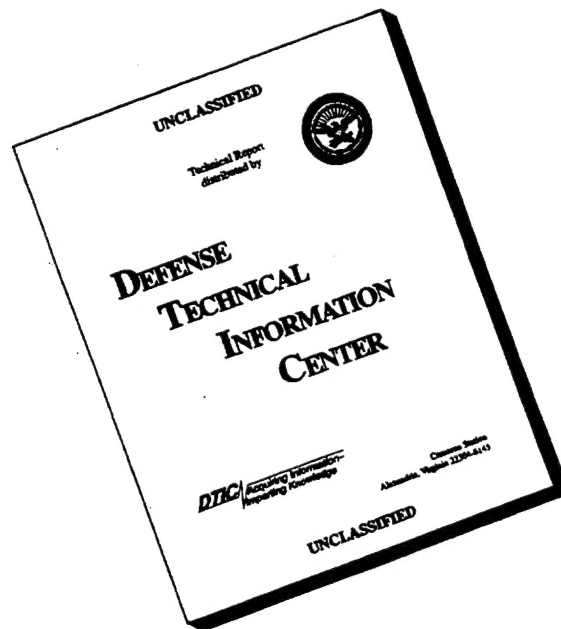**12b. DISTRIBUTION CODE**

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The purpose of this management study was to determine productivity measures for family practice physicians within the context of delivering care in Health Practice Groups (HPG) at Bayne-Jones Army Community Hospital, Fort Polk, Louisana. To develop these measures three approaches were used; a physician time study, an analysis of auxillary personnel and a comparison of productivity levels between organizations was conducted.

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THE DETERMINATION OF FAMILY PRACTICE PHYSICIAN

PRODUCTIVITY MEASURES AT

BAYNE-JONES ARMY COMMUNITY HOSPITAL

FORT POLK, LOUISIANA

A GRADUATE MANAGEMENT PROJECT SUBMITTED TO

THE FACULTY OF BAYLOR UNIVERSITY

DIVISION OF HEALTH CARE ADMINISTRATION

IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

MASTER OF HEALTH CARE ADMINISTRATION

BY

CAPTAIN CHARLES K. TANNER, MS

MAY 1995

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ACKNOWLEDGMENTS

ABSTRACT

The purpose of this management study was to determine productivity measures for family practice physicians within the context of delivering care in Health Practice Groups (HPG) at Bayne-Jones Army Community Hospital, Fort Polk, Louisiana. To develop these measures three approaches were used; a physician time study, an analysis of auxiliary personnel and a comparison of productivity levels between organizations was conducted.

The time study revealed that individual military family practice physicians may devote between 97 to 104 hours per month to appointed patient care. The time study revealed significant differences between the amount of patient care hours military physicians may provide compared to their civilian counterparts. Military physicians provide less patient care hours per month due to the specific duties required from military service.

The analysis of auxiliary personnel reveals that each category; physicians, direct care provider, registered nurses, direct care para-professionals and administrative support impact positively on the productivity levels as measured by the number of patient visits. These results were significant at the $p < .05$ level. For approximately every additional 30 minutes of total support time input an additional patient may be seen.

Further analysis provided a means to monitor physician productivity through the use of graphical representation. The number of visits for each physician case ($N = 13$) was divided by the total time input of all personnel. By plotting this data, productivity comparisons between the 13 physicians is possible.

Difficulties in comparing productivity levels between organizations is revealed. These difficulties are due in part to the lack of standardization in reporting. To use benchmark data a greater deal of specification in the reporting methods is required.

The productivity measure recommended consist of provider specific run charts coupled with the graphical representation of time inputs and patient visits. It is further recommended that these measures be used within the context of the total quality management/continuous quality improvement management style.

I. INTRODUCTION

Conditions Which Prompted the Study

Three major events triggered this study. The first event was the collapse of the Soviet Union and the corresponding decline of threat to the United States. The decline of threat caused a perceived decline in the need for a large standing Army. The United States embarked on downsizing its military forces to meet the new level of threat and to shift corresponding monetary savings to other national priorities. This downsizing program effects the staffing levels of military treatment facilities (MTF).

The second event is the political interest in the delivery of health care. President Clinton's health care reform initiatives focused the nations attention on the delivery of health care. This focus caused a massive evaluation of delivery processes. The goal of his initiative is to reduce the cost of care and to increase access to care for the nations population while maintaining high levels of quality.

The military response to this presidential goal is the TRICARE program. This program will use regional contracts with civilian managed care organizations to augment beneficiary access to the military health care system. The TRICARE program will effect the number of patients that are seen within military treatment facilities.

In conjunction with the TRICARE initiative, Medical Command (MEDCOM) is studying the staffing levels of treatment facilities. This study developed staff level benchmarks which will assist in controlling the amount of medical personnel assigned to each facility. The benchmarks estimate the time and people needed to efficiently complete medical tasks. These measurements are intended to give the commander a measurement of the personnel needed to provide medical care in their facility (Harben, 1994). The intent is backed by an enforcement policy. Future Department of the Army policy will be that "positions that do not have a statistically justified standard by the end of fiscal year (FY)

1995 may be eliminated" (Harben, 1995). The MEDCOM benchmark study increases the commanders need to understand practitioners productivity levels.

The presidential interest in access to health care also caused Dr. Stephen C. Joseph, Assistant Secretary of Defense for Health Affairs to establish goals for MTF's in providing access to health care for active duty service members (Tomich, 1994). These goals include appointments for non-urgent care within one week and appointments for urgent care within 24 hours. The establishment of these and other access goals will impact on the amount of resources a commander may consume in delivering health care.

The final event is the organizational structure of health care services at Bayne-Jones Army Community Hospital (BJACH). MEDCOM authorizes the MTF commander to structure their facility in any approved manner to accomplish the health care mission. This ability allows commanders to be innovative in meeting the specific needs of the community they support.

The Health Practice Group (HPG) concept was developed in 1993 by Colonel Michael A. Dunn, Commander, Bayne-Jones Army Community Hospital, Ft. Polk, Louisiana. Prior to the HPG concept, the hospital used multi-specialty clinics to deliver health care. Numerous issues surrounded the use of multi-specialty clinics, including the lack of peer consultation and the difficulty in attaining economies of scale. The development of health practice groups streamlined the delivery process by allowing the family practice physicians to act as one body. These physicians also perform as gatekeepers to further specialty care.

The HPG concept is basically three health care groups that are aligned with specific Fort Polk military units. The HPGs consist of a panel of family practice physicians and auxiliary support personnel ranging from medical clerks to nurse practitioners. The HPGs reside within the hospital.

The cornerstone of the HPG structure is the "gold card" program. Under the gold card program, beneficiaries (other than active duty soldiers) have a specific physician who is responsible for their care. Beneficiaries are assigned to a HPG based on their sponsors unit. For instance, a wife of an active duty Sergeant assigned to the Military Police Battalion is assigned to HPG A. For the most part only "other than active duty" beneficiaries are assigned to health practice groups. Normally, active duty soldiers are treated at Troop Medical Clinics, but some units are aligned with the HPGs. Beneficiaries of this program include family members of soldiers assigned to Fort Polk, eligible retirees and their dependents.

The goal of the HPG program is to increase the access to care by increasing the patient/physician relationship and by streamlining the access to specialty care. This event is important in that this structure dictates the number of patients that are actually seen.

With the advent of the gold card program also came the incorporation of the total quality management (TQM) philosophy. In the past, the management by objectives (MBO) philosophy was used in managing the organization. A tenet of the TQM philosophy is the concept of continuous quality improvement. This concept asserts that processes can be continuously improved versus the MBO perspective of meeting an objective and moving on to the next project. Total quality management also emphasizes the use of statistics in productivity improvements. The change in management philosophy caused the leadership to examine how they measure productivity and once measured, how they use the results.

The three events and the management philosophy change are the driving force behind this project. The development of productivity measures for the HPGs will use the current management philosophy and the current environment.

Statement of the Management Question

The combination of these three events require the commander to know what he can expect from his staff. The commander must know, "How many patients can a physician see, given the time available, and the amount of auxiliary staff available?" The answer to this question will allow the commander to ascertain the number of personnel required to deliver health care services to the beneficiary population. This information will also enable the commander to predict how many beneficiaries will receive care from the facility.

Review of the Literature

Productivity Measures. The main issue examined is physician productivity. Productivity is the relationship between quantities of inputs and quantities of outputs, when both are expressed in real physical volume terms (Donabedian, 1973). Productivity is one of the key measures of an organizations performance[1] (Wolper, 1995). With this information the commander will be able to justify requests for additional assets, monitor physician productivity, and establish realistic goals.

The first issue in measuring productivity is the specification of the product (Donabedian, 1973). Good health, wellness, pain relief or patient visits are some of the products delivered in healthcare. Many approaches are used to specify the productivity of physicians. Some of the variables used in productivity research include cost, time, auxiliary inputs, and patient visits.

Most research approaches use cost as a variable in determining physician productivity. Cost data is normally available in the civil sector and is readily accessible.

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[1]Other indicators of organizational performance are; effectiveness, efficiency, profitability, quality of performance and quality of work life.

Cost is used as a productivity measure in an attempt to control for the multiple amount of inputs used in healthcare for a given service. Cost for supplies, labor and equipment can be analyzed as an input measure and compared to output measures. Since reliable, in-depth, cost data is not readily available in military treatment facilities, it is difficult to accurately use cost as an input variable in determining productivity levels.

In a management context, it may not be desirable to use cost as a variable even if available. Military physicians are "employees" of the hospital. It is assumed that cost variables would not be applicable to use since costs do little to increase productivity of these physicians. There is little or no financial incentive to motivate military physicians to increase productivity. Cost, as a variable, is therefore limited to crudely estimating the amount of input from the various sources within the military healthcare delivery system. The literature does offer other methods of determining productivity that may be useful in the military context.

The time available to see patients is the most important variable in regards to physician productivity (Dunn, 1994). Several studies include time as an input variable to evaluate the productivity of physicians. How physicians use their time will effect the amount of patients seen. Time, as an input variable, has some drawbacks.

One weakness is that specific time utilization data is not normally available. It is difficult to directly analyze specific practitioners time utilization patterns, therefore, indirect macro approaches are used. These macro approaches use the total time spent in the office, hospital or on call as variables in productivity research instead of the specific time that physicians spend with a specific patient.

Another concern is that the delivery of healthcare in the military differs from that of the civilian delivery system. Certain authors discard military physician productivity data. Research conducted by Mainous, et. al., discarded the military physicians from their sample

due to significant differences between military family practitioners and civilian family practitioners. A great deal of the differences between the two rests with the utilization of time.

A measure frequently used to measure output is the patient visit. There are several types of patient visits, for example; office visits, telephone consults, hospital visits. To compensate for these differences, many information management systems assign various weights to the different type of visits using a relative value scale. It also should be clear that the content of patient visits changes over time, between specialties, and will vary from case to case (Donabedian, 1973). Like many studies, specific information on the content of patient visits is not available for this study. It is understood that these variations may cause problems when attempts are made to compare the various measures.

Productivity Research. A consistent theme in productivity research is the use of physician time. It seems that the area for greatest productivity increases will concentrate on how physicians use their time in the production of healthcare. What is lacking in productivity research is specific data on what services physicians produce. Feldstein (1988) viewed healthcare not as a final output but one input among many which contribute to the goal of "good health." He presented the concept of the health production function in his study of how to allocate different resources. In healthcare, health can be produced using different combinations of inputs. This is unlike the production of for instance automobiles. His goal was to present an analytical model that would determine how to allocate resources among the various programs to achieve an increase in health.

Feldstein states that to use the health production function it is imperative that the desired output be explicitly defined. The goal of improving access to care does not meet

his criteria. The output must be defined in terms such as age or sex groupings in order to target programs that will have the greatest effect on health.

Reinhardt's (1972) study of physician productivity is used as a foundation for many follow-on studies. He studied the productivity of office based, self employed, American physicians. He approached the problem by using an expanded version of the basic productivity equation; inputs-process-output. The output measurement he used was the number of patient visits and annual billings to patients. The input variables were the number of aides employed by the physician and the weekly number of hours spent by the physician in their practice. These variables were further broken down into specific types of aides and where the physicians spent their time; office, hospital or home.

Reinhardt found that the use of auxiliary personnel can have a substantial and positive impact on the average physicians productivity. He also found that the physician has little control over the nature of cases that are presented. This lack of control alters the amount of time the physician spends with each patient.

Another finding indicated that physicians in group practices tended to use aides more efficiently than physicians in solo practice. Brown (1987) replicated Reinhardts study and this finding, except he found groups to be four times as productive over solos. Both researchers found that group physicians tend to see more patients than solo practitioners. They also note that group practitioners tended to work longer hours and use a greater number of aides than did their solo colleagues. The family practice physicians at BJACH work in three groups. This dynamic would allow for and limit comparisons of findings to group practices.

A significant finding in reference to the utilization of auxiliary personnel is that the marginal product increases up to a point and thereafter diminishes. Reinhardt found that the marginal product of auxiliary input to physician productivity levels reach zero at a level

of between 5.0 and 5.5 aides per physician. In his replication of Reinhardts study, Brown concluded that with the exception of physician assistants used in group settings, non-nurse aides were over-employed. In Browns' estimate, if physicians are to produce more efficiently in relation to cost, they should use less administrative and technical assistants.

One limit to Reinhardts study is that detailed information on the various services produced by the physician was not available. This condition remains true with many studies. This situation caused him to approach physician productivity indirectly by using the number of visits in terms of time spent in the office, hospital or home. He also used patient billing figures as a variable to establish productivity measures.

Reinhardt also found that American physicians differ widely in their ability or willingness to attain maximum levels of productivity. His findings show that physicians have different levels of ability and motivation. This factor is relevant when predicting the number of patient visits of a given physician or comparing the productivity across a group of physicians. He also concluded that some physicians tend to waste possible productivity gains due to inefficient use of auxiliary personnel.

A goal of a later study by Kehrer and Intriligator (1974) was to examine the how the healthcare community meet the needs of a specific population. They assumed a fixed stock of physicians in the population and postulated the need to increase physician productivity to meet the health care needs of the population. Their survey questioned physicians in office based practices in regard to the delegation of tasks to auxiliary personnel. They found, as did Reinhardt, that specific task information was not available. This factor limited the analysis of physician time utilization and its impact on delegating tasks to auxiliary personnel. Their findings show a possibility for an increase in productivity through the employment of more auxiliary personnel. The authors cautioned that individual physicians determine the amount of tasks that are delegated. As with Reinhardt, they

concluded that physician behavior may need to be altered to increase productivity levels through increased utilization of aides.

Steinwachs, et. al. (1986) examined estimates of physician requirements made by the Graduate Medical Education National Advisory Committee (GMENAC). They compared the GMENAC's estimates with actual practices in three HMO's. The authors did not directly address non-physician inputs into the productivity of physicians. They submit that there is evidence that non-physician providers take away from physician productivity levels "because of the time physicians spend in supervision." GMENAC theorized that non-physician providers would enhance physician productivity levels through the provision of separate support services. This factor is not pursued further in their study and seems to contradict previous studies.

Golden and Seidel (1978) used a systems analysis approach to the study of staffing patterns in health maintenance organizations. They found that the largest number of tasks are within the responsibility of auxiliary personnel but the most complex tasks rest with the physician. They indicated that patient need and physician time are important variables in the staffing patterns of HMO's.

An early study in physician productivity was conducted in 1943 by Antonio Ciocco. His data was collected as a result of a survey sent to private practice, general practitioners in the District of Columbia, Maryland and Georgia. He studied the time physicians spent in the office, hospital and in the home of the patient and compared this with the number of visits the physicians counted during this time period. He also approached workload by analyzing the total number of individual patients a physician should have.

Ciocco (1943) found that there are differences in the number of patient visits with respect to the practitioners age. Physicians apparently hit their peak of activity (in terms of number of patient visits) between the ages of 35 and 44. He also reports that general

practitioners in larger cities spend on average 5.2 hours per day in the office seeing patients. In more rural practices, physicians spend about 6 hours per day in the office. His analysis resulted in the average 1943 general practitioner seeing approximately 4.3 patients per hour.

When the survey asked physicians if they could increase their patient load over 50% of the physicians said they could. Analysis of this data generated a projected optimum patient load of between 123 and 129 patients per week in the three different locations. Ciocco warned that this is not the maximum number of patients that could be seen by the physician. If the physician limited their practice to the office setting more patients may be seen. This is interesting in that military physicians rarely make visits to the home and their offices are collocated with the hospital. This setting allows for the presentation of a "maximum number of patients that could be seen" figure.

Ciocco's results represented the most patients a physician could see in 1943 (office, hospital and home visits) and still furnish satisfactory care. He believed that the true capacity of the 1943 provider is in a range between 125 and 160 patients per week depending upon the patient population. He submits that in order to retain the average patient load at 160 patients per week it would require that the person-per-physician ratio not exceed 1100:1 in Baltimore, 1500:1 in Maryland and 2400:1 in Georgia. Physicians in the HPGs are assigned a patient population of approximately 1500 patients.

Frech and Ginsburg (1972) attempted to break the barriers Reinhardt and others encountered in measuring inputs and outputs by using the "survivor model." Their contention was that previous attempts to reach an optimal scale did not adequately control the variations in physician's hours (Lee, 1990). They theorized that as long as physicians maximize some utility function their actions will cause the most efficient size of medical

practice. This utility function can be anything; leisure, interesting cases, income, or preferences for certain organizational structures.

Their study compared shifts in the distribution of market share of various group sizes from 1965 to 1969. They postulated that the market will determine survivors and that the survivors would be indicators of the optimal practice arrangement. The interesting item in this study is the idea of utility function. The utility function is similar to Reinhardt's finding that physicians have different levels of motivation. Their concept of the utility function and Reinhardts motivation theory may be used as an additional constraint in the development of productivity measures.

Health Care Delivery Systems. A healthcare delivery structure that is getting close attention is the Health Maintenance Organization (HMO). It is touted that the HMO structure allows for more patients to be seen while holding costs down and maintaining quality. The HMO structure is such that it "manages" the delivery of healthcare of it's subscribers. Depending on the type of HMO, subscribers normally lose some control in their healthcare choices in exchange for lower cost. There are several types of HMOs, for instance, the staff model, the group model and the network model HMO. The civilian HMO model that most closely resembles the military health practice groups is the staff HMO model.

The staff model HMO is structured to provide the entire administration of the health plan as well as the direct and actual application of physician services (Shouldice, 1991). In other words, the staff model HMO provides both the administrative and medical functions of the health plan. Physicians are employees and a medical director is responsible for the overall quality and quantity of the medical services. This structure parallels the military model in that military physicians are members of the armed services and report to the

Deputy Commander for Clinical Services (DCCS). The DCCS and ultimately the hospital commander are responsible for both the quality and quantity of medical services provided by the health practice groups.

Comparing the salaries of staff model physicians and military physicians reveal numerous similarities. Both are paid less than their fee-for-service counterparts but in trade they do not shoulder the overhead cost of the practice and compensation is guaranteed regardless of the number of patients seen (Shouldice, 1991). In addition, both sets of physicians are relieved of the administrative burden of collecting fees and managing the activity as in a private physician business.

Both situations require strong physician commitment and loyalty since both models provide the weakest physician incentives to control utilization. On the other side, since the physicians are employees, management can influence physician's behavior to a greater extent than other organizational structures.

A disadvantage of these structures is that they require management to accurately project the number of physicians and support personnel that are hired. A poor match to the beneficiary population will result in excessive cost or poor customer satisfaction. Another disadvantage is the loss of autonomy for the individual physician.

Another type of HMO is the group model. The group model HMO has many qualities of the HPGs except that group model HMO's are multi-specialty type organizations. The HPG operating within the hospital can act similar to the multi-specialty group in that all the specialty services are located "in-house." However, the HPG organizational structure consist of only family practice physicians and comparisons with group model HMO will tend to become blurred when analyzing staffing ratios.

Management Efforts. An important factor in the type of management style employed is the environment or setting of the work performed. The setting of our study is in the primary healthcare arena. This setting is highly complex with a great deal of sophisticated equipment. The workers are well educated and perform their duties in stressful situations. This complexity can cause difficulties in the management and delivery of the healthcare product.

One difficulty in establishing primary health care systems and productivity levels is the establishment of definable goals. What is it that we should produce? One approach is to use the cost, access, quality triangle (Fuchs, 1974). Victor Fuchs approached the problems of health care from an economic context. His training as an economist and his experience on a medical school faculty provides a unique view of productivity in health care. Fuchs examined the issues in health care starting from three fundamental economic observations: resources are scarce in relation to human wants; resources have alternative uses and people have different wants and there is variation in the relative importance that people attach to them. Fuchs (1974) states that a change in one variable will ultimately effect the other two. For instance, to increase access you will either increase cost or decrease quality.

He further states that the general problem of access to healthcare is the failure of the medical care market to match supply and demand. This is a greater factor then one of individual physicians not producing. Fuchs (1974) stated that the use of "physician extenders" (physicians' assistants, nurse practitioners, etc.) would provide ready access at a reasonable cost. He further states that to create a health care system that will provide adequate access at reasonable cost requires taking a realistic view of what patients want and need and what physicians actually do. It is within this setting that various management approaches may be applied.

As is evident the management of healthcare processes can have a significant effect on physician productivity. There are several approaches to management thought. Two such approaches are the scientific management approach and the behavioral approach (Stoner, 1982). Scientific management arose in part from the need to increase productivity. Frederick Taylor, a leader in scientific management theory, approached the problem of increasing productivity through the use of production line time studies. He studied the time it took to complete a task and the movements of workers on a series of jobs (Stoner, 1982). Once this data was collected he divided each job into its individual components. He then designed the quickest and the best methods of operation for each part of the job. His "one best way" approach would identify those practices that could be eliminated, combined, or improved. Through this method he theorized that productivity would increase. It may be difficult to apply this style completely in the healthcare arena. If good health is the goal then a multitude of inputs may be required. What the population defines as good health in urban America may require different inputs than the populations definition of good health in Africa. Therefore there is usually not "one best way" to attain the goal of good health. What is valuable in Taylor's research is the elimination of redundancies in the process. Though not within the scope of this paper, productivity increases could be achieved through the examination of the various processes that enter into the delivery of healthcare.

Elton Mayo is famous for his Hawthorne Experiments and is considered as a leader in the behavioral approach to management. The Hawthorne experiments examined human behavior in work situations (Stoner, 1982). In this experiment Mayo discovered that when management gave special attention to workers, it frequently caused them to increase their efforts. He then postulated that the social environment has a great influence on productivity. This "social man" concept assumed that satisfied workers would be more

productive workers. Mayo concluded that managers need to attend to the social needs of the workers by focusing on group processes and management styles in order to increase productivity. Mayo's approach may have relevance to increasing productivity in the healthcare field. The practice of medicine is social by nature and physicians are motivated by different factors. The commander and managers have a great impact on the environment in which health care is delivered. The commander may increase productivity by insuring the construction of an environment that is conducive to the practice of good medicine.

As is apparent, Taylor and Mayo represent opposite points of view. To Taylor, man at work was entirely an economic man; therefore, he would work harder only if he could improve his economic well being. To Mayo, even the intelligent workers were people motivated largely by the need for togetherness and for individual recognition within a small group whose standards they accepted. Each man was able to prove their points.

A popular management approach, introduced by Peter Drucker, is the process of management by objectives (MBO). The essence of MBO lies in the establishment of common goals by managers and their subordinates acting together (Stoner, 1982). Each person's major area of responsibility is clearly defined. Objectives are set and are used to monitor progress toward the goal. Evaluations are sometimes based on how well the employee meets the stated objectives. Increase in productivity levels are derived from a logical and concerted effort toward well defined goals. The military has traditionally used this management approach with varying levels of success. A limit to this approach is the setting of objectives. In practice, management often excluded workers in goal setting. This caused workers to "game the system." Workers would give management what was wanted, sometimes in a less than desirable fashion. This effect caused productivity levels to decrease.

W. E. Deming's, total quality management (TQM) philosophy, is the current forerunner in modern managerial thought. This management process focuses on the quality of the product and not on productivity per se. TQM philosophy focuses on improving quality by looking for ways to improve the processes that develop the product.

An important aspect of the TQM philosophy is the principle of continuous quality improvement (CQI). The premise of CQI is that everything can be improved. Productivity and quality gains are made by empowering the people that are closest to the process to fix the process. Improvements to the processes that deliver the product are accomplished in incremental steps (Imai, 1986). Incremental improvements are unlike the MBO philosophy which accomplishes an objective and moves to the next. CQI is a continuous search for areas in which to improve and empowers workers to take action to improve those areas.

Both TQM and CQI rely heavily on statistical analysis. Statistics are used to monitor processes to identify those in or out of control. Through statistical measures changes made to the processes are monitored for there effectiveness. Many tools are used to gather data in order to make productivity and quality improvements. Some of these tools are; Cause-and-effect diagrams, flow charts, Pareto charts, run (trend) charts and statistical process control charts (Kume, 1987). Of interest is the run chart. A sample run chart is included in the appendix. Run charts may be used to plot the number of visits each physician has. The center line may be set at any figure, but the mean of the total visits of all physicians is recommended for the HPGs. Incremental lines are established at one, two and three standard deviations from this mean. These lines identify variation. There are two types of variation, common cause and special cause. Common cause variation is that variation that occurs in 68% of the sample. Improvement efforts should be focused on eliminating these common cause variations. Common cause variation would be shown as points lying within one standard deviation from the mean. Special cause variations are

those variations that rarely occur. For instance, a physicians productivity drops dramatically due to a death in the family. Improvements to the process should not be made in this instance (if they could). Special cause variations are useful in identifying causes for changes but not useful in tracking long term productivity gains.

As with all management philosophies the key is what managers do with the information they gather. The premise of TQM is to focus on improving the process. If the process is improved productivity will increase. Another important aspect of TQM is quality. Quality defines the goal of the various processes. The customer defines quality. An organization using the TQM philosophy therefore focuses on the customer and develops it's goods or services to meet the customers definition of quality. By focusing on the customer the TQM philosophy agrees with Fuchs.

MEDCOM Benchmark Study. Prior to the reorganization of Health Service Command (HSC) to MEDCOM, HSC conducted a study on productivity in order to establish benchmark staffing and productivity levels. These benchmarks are used by MEDCOM to compare MTFs. The outcome of the study was the development of guidelines for; the number of hours a provider should be available in the clinic, the mean number of monthly visits a provider should have, the mean time of a patient visit, and the provider to auxiliary support staffing ratio. In their study the staffing assessment team researched and developed provider screens based on provider hours only. The premise was that the number of earned providers basically drive productivity levels and the number of support personnel needed. The team used the MEPRS database to develop their study. Their approach is similar to the current study in that they analyzed the time utilization patterns of physicians. This study started with a 2,087 hour work year and subtracted 10 holidays. The work day was defined as 8 hours. Their study subtracted time available for patient

care through a standard "non-available" variable, rest variable, continuing education factor, readiness training variable and wards or rounds variable.

Of interest is their use of an overtime variable. This variable allows for 10.83 hours of overtime per month. The use of this variable could be controversial in applying the available provider hours to the staffing of facilities. By adding 10.83 hours of available time it, in fact, expands the duty day. MEDCOM included the variable to adjust for the required overtime used to dampen the effects of workload peaks. The team did not include a variable to offset workload valleys or missed appointments that cannot be filled. During these periods the physician is on duty but is unable to produce workload due to lack of patients. The benchmark study also did not address "on call" hours directly. Physicians conduct call on a 24 hour basis to respond to patient needs within different locations of the hospital. Physicians are credited with the workload they generate when on call but this workload is not attributable to appointed patients within the HPGs. One problem with on call workload is the variability. The stand-by nature makes on call workload difficult to project. In the current management information system, workload figures from the on call status cannot be separated from that of workload generated from appointed patient care in the HPG.

This study replicates many of the procedures used in the MEDCOM study. The difference between the studies is that the MEDCOM study focused across several military treatment facilities and this study focuses on BJACH.

Purpose of the Study

The purpose of this study is to develop measurements for the commander and managers to use in monitoring family practice physician productivity. To determine the number of patient visits the commander can expect with the current number of physicians and staff on hand.

Objectives

a. Provide an analysis of military physician time utilization. Determine the factors that take away from the military physicians time to see appointed patients.

b. Evaluate the use of auxiliary personnel on physician productivity. Determine if the various auxiliary personnel impact the productivity levels of family practice physicians in the HPGs.

c. Complete a literature review of productivity measures, managerial efforts to increase productivity and workload data of outside agencies. Develop the literature review to benchmark historical patient visit data of HPG practitioners with benchmark data from the literature. Determine the current amount of visits produced by the HPG family practice physicians.

d. Develop recommendations for a measurement tool that targets significant predictors of physician productivity to enable the commander to manage access to care at BJACH.

II. METHOD AND PROCEDURES

Three steps are used in the development of a productivity measurement tool. The first step involves the analysis of military family practice physicians time utilization. This analysis is important in that the practice of military medicine has unique factors not present in civilian medical practices. In order to use comparative information from physician productivity research, it is important to understand certain variables that detract the military physician from patient care.

The second step is an analysis of the input from auxiliary personnel in the productivity levels of family practice physicians. This is important since physicians have different levels of support and this will effect the productivity of the physician.

The third step is to compare civilian healthcare providers to military providers. This will allow us to benchmark BJACH productivity levels with outside agencies.

Part One.

Time analysis of Military Physicians.

This analysis attempts to quantify the amount of time a military physician may devote to appointed patient care within the HPG. This process starts at the total patient care hours available and subtracts time that is lost by various events. These events include; federal holidays, military training holidays, "on-call" time, annual leave, temporary duty, professional officer filler system (PROFIS), administrative time, and a miscellaneous time variable. The physician sample (N = 13) is taken from the three HPGs operating at Bayne-Jones Army Community Hospital. All members are family practice physicians working in one of three HPGs. Unlike the MEDCOM Benchmark Study, this analysis uses actual leave and TDY data. Other variables from the MEDCOM study are modified to reflect expert opinion and local factors.

Data/Data Collection.

Data for this part comes from expert opinion of physicians and administrators

assigned to BJACH. The Medical Expense and Performance Reporting System (MEPRS)

database, leave logs and TDY logs are also used as sources of information.

Analysis

Base. A normal workday is nine hours (0730 - 1630) with one hour allocated for

lunch (Swann, 1994). Therefore, the physician is available for patient care eight hours in

any work day. To start, the total annual patient care hours available per physician is 2,088

hours (Monday through Friday (261 days x 8 hr@day)).

There are thirteen physicians in the sample group. This yields 27,144 total patient

care hours available (2,088 hours x 13 physicians) for the sample group.

Holidays. The first variable is holidays. The federal government recognizes ten

holidays. Subtracting 10 federal holidays or 1,040 hours from the total hours available in

the group leaves 26,104 patient care hours remaining or 167.3 hours per month.

(10 holidays x 8 hours x 13 physicians = 1,040 hours, 27,144 - 1,040 = 26,104).

Training Holidays. The hospital commander may authorize a "training holiday.

Military training holidays are time off for special military reasons and are given at the

commanders discretion (Dunn, 1994). For instance, the commander may authorize a

training holiday following an inspection. Normally, three training holidays are given during

the year. Subtracting three military training holidays or 312 hours yields 21,658 remaining

patient care hours (3 training holidays x 8 hours x 13 physicians = 312 hours,

26,104 - 312 = 25,792). This variable was not included in the MEDCOM benchmark study.

"On Call". The third variable is the "on call" system. A physician is "on call" in the hospital all year using a rotating roster. The on call system in the health practice groups requires a family practice physician to respond to patients throughout the hospital. The physician may be called to work in the emergency room, to deliver a baby or may work in the health practice group (Swann, 1994). Caution is in order when evaluating workload against the time available, since the physician is still credited with the work they generate. This work may or may not be conducted in the health practice group. The point here is that the on call physician is not available to see patients by appointment in the health practice group.

Compensatory time is given to the physician on call (Swann, 1994). If duty is conducted during Monday through Thursday, two days of availability are lost. The day of call and the next day as compensation. If call is conducted on Friday, only the day of call is lost. No days are lost for Saturday duty and one day is lost for duty on Sunday. This compensatory time is subtracted from the amount of patient care hours available. Subtracting the "call" effect of 4,024 lost hours from the 25,792 hours available gives 21,768 patient care hours available for the thirteen physicians in the sample. The following figure describes how the compensatory hours are derived.

On Call Effect

	2 days lost, M - TH	1 day lost, Friday	0 days lost, Saturday	1 day lost, Sunday
Number of days in year lost.	400	51	0	52
Number of hours lost per day.	8	8	8	8
Total hours lost per year.	3200	408	0	416

FIGURE ONE

Annual Leave. The military provides thirty days of leave annually. Service-members may normally take this leave upon request. Since the leadership has limited control over when leave is taken, it is difficult to project lost patient care hours. Therefore, the effect of leave on the time available to see appointed patients is projected using two methods. These two methods will be carried through the rest of the study in the form of template data and historical data.

The first method relates the actual leave taken by the sample group of thirteen physicians in fiscal year (FY) 1994. During FY 94 the thirteen physicians took 324 days of leave or 2,592 patient care hours. Subtracting 2,592 lost hours due to leave from the 21,768 remaining hours yields 19,176 of available patient care hours.

The second method is derived by forcing the thirteen physicians into a standard distribution template with a mean of five physicians taking fifteen days of annual leave, three physicians taking seven days leave, three taking twenty two days, 1 taking all thirty days leave and one taking no leave. Leave days in this method exclude weekends and are only counted as workdays. Subtract the 192 days or 1,536 leave hours taken in the template data from the 21,768 remaining hours yields 20,232 available patient care hours.

Temporary Duty. Military physicians are authorized temporary duty (TDY) time to maintain their graduate medical education. Again, this variable, like the leave variable is difficult to control. Two methods are employed.

The first method employs the actual TDY taken by the physicians during FY 94. Eighty one days or 648 hours are lost to patient care due to TDY taken during FY 94. Subtracting the 648 hours from the 19,176 available hours (derived from actual leave data) yields 18,528 hours.

The second method uses hospital TDY policy. It is hospital policy to allow physicians five days of TDY. Five workdays of authorized TDY would result in 520 hours of lost patient care hours (8 x 5 x 13 = 520). Using the figure 20,232 derived from the template leave data and subtracting the projected hospital policy TDY days allowed for the physicians (520) yields 19,712 available hours.

PROFIS. Unique to the military is the Professional Officer Filler System (PROFIS). The PROFIS requires military physicians to train with their assigned tactical unit in order to prepare them for their wartime mission. Normally, 5 workdays are provided for the PROFIS. Historical data is not available for FY 94. Subtracting the 520 hours of lost time (5 x 8 x 13 = 520) due to the PROFIS training effect from the historically based figure of 18,528 leaves 18,008 hours. Subtracting 520 hours from the template figure of 19,712 leaves based leaves 19,192 hours of available patient care time.

Administrative Time. By hospital policy physicians are allowed one half a day per week to take care of administrative business. To avoid double counting hours we must calculate the remaining time available for patient care back into weeks. Figures 2 and 3 depict the calculations for administrative time.

Administrative Time Effect (Historical)

(18,008 hours/8 hours)/(5 days week) = 450.2 Weeks
(450.2 weeks)(4 hours per week) = 1800.8 hours
18,008 hours available - 1800.8 admin. hours = <u>16,207.2 hours</u>

FIGURE TWO

Administrative Time Effect (Template)

(19,192 hours/8 hours)/(5 days week) = 479.8 Weeks
(479.8 weeks)(4 hours per week) = 1919.2 hours
19,192 hours available - 1919.2 admin. hours = <u>17,272.8 hours</u>

FIGURE THREE

<u>Miscellaneous Variable.</u> In an attempt to control for other time lost, a miscellaneous variable is assigned. This variable accounts for coffee breaks, conversations, informal meetings, etcetera. Subtracting one half hour a day from each physician requires computation of the available time into weeks in order to avoid double counting. Figures 4 and 5 depict the computations to account for the miscellaneous variable.

Miscellaneous Factors (Historical)

(16,207.2 hours/8 hrs)/5 days = 405.18 weeks
(.5 hour @day x 5 days) x 405.2 weeks = 1,012.9 hours
16,207.2 hours - 1,012.9 hours = <u>15,194.3 hours</u>

FIGURE FOUR

Miscellaneous Factors (Template)

(17,272.8 Hours/8 hrs)/5 days = 431.82 Weeks
(.5 hour @day x 5 days) x 431.8 Weeks = 1,079.6 Hours
17,272.8 hours - 1,079.6 hours = <u>16,193.2 hours</u>

FIGURE FIVE

Results

This analysis projects that the total hours available, with 13 family practice physicians, for appointed patient care, in the HPG, to range from 15,194.3 to 16,193.2 hours. The results for annual, monthly and weekly physician times for both the 13 physician and individual physicians is given in table 1. Included in the table is the addition of the 4,024 on call hours not used in the MEDCOM benchmark study. The 4,024 on call hours are added to the results to allow comparisons between this analysis and the MEDCOM benchmark study.

Results of Family Practice HPG Time Analysis

Time Period	Historical Data 13 Physicians/Individual	Template Data 13 Physicians/Individual
Annual Physician Time	15,194.3 / 1,168.8	16,193.2 / 1,245.6
Monthly Physician Time	1,266.2 / 97.4	1,349.4 / 103.8
Weekly Physician Time	292.2 / 22.5	337.4 / 26.0
Annual with on call time added back in.	19,218.3 / 1,478.3	20,217.2 / 1,555.2
Monthly with on call time added back in.	1,601.5 / 123.2	1,684.8 / 129.6
Weekly with on call time added back in.	400.4 / 30.8	421.2 / 32.4
MEDCOM Benchmark Annual	1,546.2	1,546.2
MEDCOM Benchmark Monthly	128.8	128.8
MEDCOM Benchmark Weekly	32.2	32.2

TABLE ONE

The hours the physician is available can be used to project workload. Table 2 projects the number of patients that may be seen in a week with varying rates of patients seen per hour. The MEDCOM benchmark for the number of patients seen per hour is 3.3 visits.

Individual Physician Weekly Patient Visits Projections

	Number of Patient Visits per Hour				
Source	4	3.3*	3	2.5	2
Weekly visits, from historical analysis, 22.5 hours.	90	74.3	67.5	56.3	45
Weekly visits, from template analysis, 26.0 hours.	104	85.8	78	65	52
Weekly visits with on call added in historical analysis, 30.8 hours.	123.2	101.6	92.4	77	61.6
Weekly visits with on call added in template analysis, 32.4 hours.	129.6	106.9	97.2	81	64.8
MEDCOM benchmark, 32.2 hours.	128.8	106.3	96.6	80.5	64.4

TABLE TWO

*- MEDCOM Benchmark for number of patient visits per hour.

Discussion.

When comparing this analysis with the findings from the MEDCOM Benchmark study it reveals some interesting similarities. The MEDCOM benchmark is 128.85 hours per month of time available for the physician to see patients. This also equates to 32.2 hours per week. What is easily seen is the effect of the on call variable. With the on call variable subtracted from the total time available, physicians are available to see appointed patients

using historical data, 22.5 hours per week or 26.0 hours using the template data. This is

significantly different than the MEDCOM benchmark of 32.2.

When the on call time is added back in it is interesting to note that there is 1.4

hours less per week using the historical data as compared to the MEDCOM benchmark.

Conversely, when using the template data, there is .2 hours more time available per week

as compared to the MEDCOM benchmark. This may indicate that studies that do not use

historical data tend to overestimate the time physicians are available for patient care.

To increase productivity in appointed patient care it is necessary to examine the

variables that detract from the time available to see patients. The first variable examined

that the commander may influence is training holidays. For each training holiday, 104

patient care hours are lost. If the average physician sees 3.3 patient per hour, this equates

to 343.2 patient visits lost per training holiday. Reducing the number of training holidays

would increase the amount of patients seen. The disadvantage of reducing the number of

training holidays is the effect on physician morale. Since the entire Ft. Polk community

normally participates in training holidays, physicians may view their lack of participation as

punishment. This may effect long term productivity.

The second variable is on-call. The management information system is lacking in

accurately differentiating between workload generated while on call and workload

generated through appointments. Improvements in the reporting system may assist future

research in determining physician time available for appointed care. A review of

compensatory time may also be in order. Productivity gains may occur by denying periods

of compensatory time if the physician was not utilized during their on call shift.

The third variable is annual leave. Though the commander has limited control over

when physicians request leave, the commander is the approval authority. It may be

possible to develop a system that assists the commander in evaluating these requests. For

instance, the commander or department manager should have input on peak and valley workload periods during the year. This information would allow for adequate staffing levels during these times.

This productivity study could be tied to the approval of leave requests. Projections of productivity could assist managers in managing the workload of the HPG. Productivity levels could be matched against workload peaks and valleys to ensure adequate physician coverage.

The fourth variable if TDY. Comparing historical TDY data with hospital policy shows that a greater amount of TDY is approved than is hospital policy. The commander could decrease the amount of TDY or increase the use of the video teleconference (VTC). The use of the VTC may meet the graduate medical education needs of the physicians. Again, caution should be applied since TDY is often viewed as a reward. Removal of TDY trips may have an adverse effect on long term productivity.

The fifth variable is administrative time. Productivity increases may be possible through increasing the time available to see patients by eliminating some administrative procedures. To accomplish this, a time and motion study could be conducted to establish what administrative duties physicians accomplish. Once established, this duties could be divided into their individual components and evaluated to distinguish which duties the physician must accomplish and which duties auxiliary administrative personnel may accomplish.

The final variable is the miscellaneous variable. The department chief has control over this variable. Increased supervision of the physician and auxiliary personnel may yield an increase in productivity by eliminating time spent in unnecessary activities. Again caution is in order. A drastic change in management style may cause a loss long term productivity.

Part Two.

Analysis of Physician Utilization of Auxiliary Personnel.

The second step in developing a productivity measure is an analysis of physician utilization of auxiliary personnel. This step is important as it provides insight into the changes in the number of visits with varying levels of auxiliary personnel supporting the physician. Data is available on the amount of time each physician uses auxiliary personnel. Specific times for specific tasks are not available. Only the total time auxiliary personnel are used by a physician is available. This analysis compares the time physicians use auxiliary personnel to the number of visits each physician has. From these measures it may be possible to predict the productivity gains or losses of additional auxiliary staff.

Data/Data Collection

The MEPRS database and the position control register are used to gather the data. The people/objects/events for this study were the family practice physicians and their auxiliary personnel who deliver healthcare with the Health Practice Groups. The population of family practice physicians (N = 15) for this study practiced medicine during fiscal year 1994. This population was reduced (N = 13) since two physicians worked less than 6 months of reportable workload in fiscal year 94. The population of auxiliary personnel varied throughout the year, therefore a specific count is not available. This study uses the amount of time reported in clinic by auxiliary personnel as a count of time consumed by the physician towards workload. This time is not attributable to any specific auxiliary person but it is attributable to specific physicians. The time of auxiliary personnel is treated as a consumable by the physician. Auxiliary personnel consist of direct care providers (physician assistants and nurse practitioners), registered nurses, administrative personnel and direct

care para-professionals. Physician and staff personal confidentiality was maintained

throughout the study.

Study Design

Operational definitions of variables

Dependant variable. The operational definition of the dependent variable - patient

visits - is defined as an encounter with an authorized patient to a separate, organized clinic,

for examination, diagnosis, treatment evaluation, consultation, counseling, medical advice;

or is treated in his or her quarters; and a signed and dated entry is made in the patient's

health record. There must be interaction between an authorized patient and a health care

provider. Independent judgement about the patient's care must be used and documentation

must be made in the medical record to count as a visit. Patient visits is a continuous

variable.

Independent variables. The operational definition for the independent variables

were:

Family Practice Physician. The number of hours that the physician uses to generate

a specific number of patient visits. The hours attributable directly to workload.

Direct Care Provider - The number of hours that assigned direct care providers

contribute to the workload of individual family practice physicians. A continuous variable.

Registered Nurses - The number of hours that assigned registered nurses contribute

to the workload of individual family practice physicians. A continuous variable.

Direct Care Para-Professionals - The number of hours that assigned licensed

practical nurses (military and civilian) and nursing assistants contribute to the workload of

individual family practice physicians. A continuous variable.

Administrative Support - The number of hours that assigned that administrative personnel are used by family practice physicians in the production of patient visits. A continuous variable.

Functional equation

The functional equation was:

$$Y = F(X_{dcp}, X_{rn}, X_{dcpp}, X_{ast}, X_{pt})$$

$$Y = F(X_{ts})$$

$$Y = \text{Number of visits}$$

$$X_{dcp}1...X_{dcp}13 = \text{Physician assistant time input.}$$

$$X_{rn}1...X_{rn}13 = \text{Nurse practitioner time input.}$$

$$X_{dcpp}1...X_{dcpp}13 = \text{Direct care para professional time input.}$$

$$X_{ast}1...X_{ast}13 = \text{Administrative support time input.}$$

$$X_{ts}1...X_{ts}13 = \text{Total support to physician X1 through X13 time input.}$$

$$X_{pt}1...X_{pt}13 = \text{Physician time input.}$$

Alternate Hypotheses

The alternate hypotheses for this study were:

Ha1: Patient visits vary as a function of the number of patient care support hours by direct care providers.

Ha2: Patient visits vary as a function of the number of patient care support hours by registered nurses.

Ha3: Patient visits vary as a function of the number of patient care support hours by direct care para-professionals.

Ha4: Patient visits vary as a function of the number of patient care support hours by administrative support personnel.

Ha5: Patient visits vary as a function of the number of patient care support hours by the total of all support personnel (X1 through X13).

Ha6: Patient visits vary as a function of the number of patient care hours by family practice physicians.

The null hypothesis for each is that patient visits do not vary as a function of the related variable.

Statistical Methods

The scope of this analysis is limited to the family practice physicians and support personnel assigned to the health practice groups. The population drew from practitioners within the military that are selected and assigned to the HPGs at Bayne-Jones Army Community Hospital.

The HPGs consisted of 13 family practice practitioners. This population did not include family practice practitioners that had a workload of less than 6 months in fiscal year 1994 (October 1993 to September 1994). The population also does not include other practitioners or support personnel that participated in the HPGs on a temporary or limited basis.

Direct care providers (physician assistants and nurse practitioners) also produce reportable workload information. This information was not analyzed or included due to the low numbers of these practitioners, physician assistants (N = 3) and nurse practitioners (N = 1). The number of support hours each of these disciplines contributed to the workload of the family practice physicians was combined into the direct care provider (DCP) variable

and is included. The DCP variable is analyzed both separately and as part of the total support variable.

This study utilized Pearsons product-moment correlation analysis for dealing with groups of continuous variables. Multiple regression analysis was utilized to test the effects of one "time" input while controlling for the effects of other "time" inputs that may be related to Y. The hypothesized functional relationship is that the number of visits is a function of the time spent by various support staff. Alpha is initially set at the .05 level. The full model regression analyses correlates all variables individually as related to the number of visits in fiscal year 1994. The restricted model uses the mean number of visits, sets the slope at 0 and uses 1 non-linear independent predictor vector.

The method used is as follows:

Method	Equation
Full	$Y = a_o U + b_1 \text{ Physicians}$
Restricted	$Y = a_o U$

Validity. Validity of the dependent measure, patient visits, was measured by the correlation coefficient.

Reliability. The data used in this study was obtained from the MEPRS database. It was inferred that personnel in the Health Practice Groups and the Resource Management Division input the data in accordance with existing procedures and regulations.

Results

Descriptive Statistics

Descriptive statistics are displayed in table 3. The number of cases is represented

by N = 13. The mean and standard deviation given are in hours for each of the 13 cases

in the sub-population.

Descriptive Statistics

Variable	N	Mean number of hours.	Standard Deviation	Min.	Max.
Visits	13	3471.15	1051.92	2210.00	5291.00
Physicians	13	1197.84	357.82	836.64	2148.72
Direct Care Provider	13	99.77	104.84	0.00	324.24
Registered Nurses	13	126.90	36.55	58.80	194.88
Direct care para-professionals	13	2529.30	1169.50	1260.00	5149.20
Administrative support	13	1581.40	606.67	934.08	2832.48
Total support	13	4229.62	1986.22	1187.04	8500.80

TABLE THREE

Inferential Statistics

Inferential statistics are listed in table 4. All independent variables were found to be
significant at the $p < .05$ level.

Inferential Statistics
Regression of X on the Number of Visits

Effect (X)	R	R²	df1	df2	t	F	p
Physicians.	.72	.52	1	11	3.146	11.671	.00576
Direct Care Providers.	.63	.40	1	11	2.673	7.145	.02170
Direct care para-professionals.	.83	.69	1	11	5.014	25.137	.00039
Registered Nurses.	.92	.85	1	11	7.990	63.836	.00001
Administrative support.	.96	.92	1	11	10.740	114.34	.00000
Total Support.	.88	.78	1	11	6.283	39.482	0.00005

TABLE FOUR
p<.05, critical value of +/- .55

All variables exceeded the critical value (2 tail, p=.05) of +/- .5511 in a positive direction.

The slope of the regression line for the direct care provider variable is 6.30 in the positive direction. The regression line intercepts the y axis at 2,843.00 visits.

The slope of the regression line for the registered nurse variable is 26.58 in the positive direction. The regression line intercepts the y axis at 97.17 visits.

The slope of the regression line for the direct care para-professional variable .75 in the positive direction. The regression line intercepts the y axis at 1,573.74 visits.

The slope of the regression line for the administrative variable is 1.66 in the positive direction. The regression line intercepts the y axis at 851.24 visits.

The slope of the regression line for the total support variable is .47 in the positive direction. The regression line intercepts the y axis at 1,490.14 visits.

The slope of the regression line for the physician variable is 2.11 in the positive direction. The regression line intercepts the y axis at 944.54 visits.

Acceptance or Rejection of Hypotheses

Ha1: Accept the hypothesis that patient visits vary as a function of the number of patient care support hours by direct care providers.

Ha2: Accept the hypothesis that patient visits vary as a function of the number of patient care support hours by registered nurses.

Ha3: Accept the hypothesis that patient visits vary as a function of the number of patient care support hours by direct care para-professionals.

Ha4: Accept the hypothesis that patient visits vary as a function of the number of patient care support hours by administrative support personnel.

Ha5: Accept the hypothesis that patient visits vary as a function of the number of patient care support hours by the total of all support personnel (X1 through X13).

Ha6: Accept the hypothesis that patient visits vary as a function of the number of patient care hours by family practice physicians.

It is possible to produce an index of productivity using the data available. This step will identify those physicians that use or don't use auxiliary staff effectively. This index is accomplished by dividing the number of visits for each physician case by the total time inputs (physician time and all auxiliary personnel time). The results of this transformation is displayed in table 5. Once the index is established, the results are plotted on a scatter diagram. The mean of the visits per total time input is .67, with a standard deviation of .14 (x axis). The mean of the visits per hour of physician time is 2.93 with a standard

deviation of .61 (y axis). The intersection of the two means establishes the center point of the scatter-plot depicted at figure six.

Health Practice Group Productivity Analysis

Physician Case	Annual Number of Visits	Total Annual Time Input for Visits	Total input time per visit
1	4154	7818.72	.53
2	2343	4110.96	.57
3	4290	7847.44	.54
4	5291	9804.48	.54
5	3632	4421.76	.82
6	2441	3239.04	.75
7	4730	6951.84	.68
8	4131	5580.90	.74
9	2549	3978.24	.64
10	4161	6290.88	.66
11	2558	4105.92	.62
12	2635	4220.16	.62
13	2210	2186.64	1.01
mean	3471.2	5426.62	.64

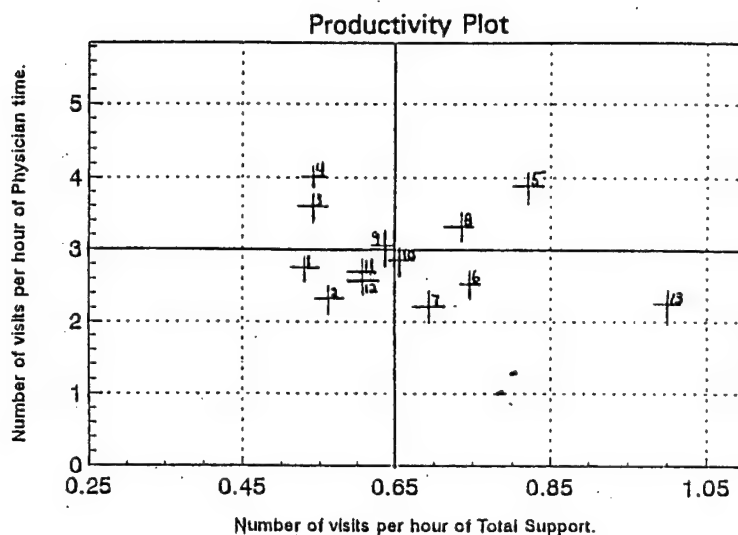**TABLE FIVE**

Productivity Plot

FIGURE SIX

Physician plot located in the upper left quadrant of the scatter diagram are the most productive since they see the most patients while using the least amount of time inputs. The physicians located in the lower right quadrant of the scatter-plot are the least productive since they use a relatively high amount of time inputs for the amount of patients seen. Specific physicians with high productivity levels are physician cases 4 and 3. Physician case number 13 is significantly less productive as compared to the other physicians in the sample group.

Discussion

The purpose of this analysis was to determine the effects of the predictor variables; direct care provider time, registered nurses time, direct care para professional time, administrative support time, the total support time and the physician time inputs, on the number of patients seen by family practice physicians. Each category of auxiliary support in the analysis have a positive effect on the average physicians productivity as measured by the number of patient visits.

This result leads us to a closer examination. It may be possible to predict the change in patient visits given the time inputs of auxiliary personnel. For every .47 hour or approximately 30 minute increase in the total of all auxiliary personnel time input consumed by the physician you can expect an increase of one visit. This result is statistically significant and would expected to be due to chance less than 5 times out of 100,000 times.

The definition of a patient visit includes the requirement of contact with a physician. Therefore, the physician time input variable is a limitation to the number of patients that may possibly be seen in an hour. Other variables that may effect the total number of patients it is possible to see include physical restrictions such as space, examination rooms, equipment or supplies.

The scatter-plot depicted in figure six is a tool the commander can use to determine individual physician productivity. The most powerful use of this graph is the specific identification of providers activities. This study identified physician case numbers 4 and 3 as being more productive than other physicians in the group. The commander of department chief could study what makes these physicians more productive in order to increase the productivity levels of the other physicians. This analysis also reveals that physician case 13 is significantly less productive than the other physicians in the group. The commander can focus efforts upon this individual to increase the physicians productivity level. This efforts may include training in the use of support personnel, personal counseling, or decreasing administrative burden.

Part three

Comparison of Military Health Practice Groups (HPG) to Civilian Health Care Providers

The third step involves the gathering of productivity and staffing data from the literature and comparing this data to the health practice groups. The HPG data for this analysis come from the MEPRS database. The MEPRS database collects data on physician workload throughout BJACH. Civilian healthcare organization productivity data is from the literature presented in the literature review sections of this study. These organizations serve as benchmarks.

Workload Comparison Workload is reported in several different formats by various organizations. The lack of a standardized reporting system for workload increase the difficulty in comparing military healthcare organizations to civilian healthcare organizations. The results of the productivity comparison is displayed at table 6. These results are in terms of weekly average hours and visits.

It is evident that the total hours a military healthcare provider devotes to patient care is significantly less than their civilian counterparts. This impacts on the total amount of patients seen. What is interesting is a comparison of the number of patients seen per hour. The average number of patients seen per hour for family practice physicians at BJACH is 2.9. With the exception of Ciocco's 1943 study, this rate is higher than all other reported civilian rates. The MEDCOM goal of 3.3 patients per hour is the second highest rate behind Ciocco's 1943 rate for physicians practicing in the District of Columbia.

Comparison of Average Weekly Workload

Practice Setting	Total Hours Worked	Patient Care Hours	Number of Office Visits	Number of Hospital Visits	Office Visits (minutes)	Hospital Visits (minutes)	Patients per Hour	Total Visits
Kaiser model HMO (1)	48.7	45.1	120.0	23.6	17.6	26.3	2.66	143.6
Other group HMO (1)	48.0	43.3	105.7	18.9	19.3	35.1	2.44	124.6
Staff model HMO (1)	48.6	43.3	85.2	26.9	21.8	41.5	1.96	112.1
Carlson averages (1)	48.9	44.3	103.0	24.9	n/a	n/a	2.33	127.9
Mainous averages (2)	62.2	58.9	113.3	n/a	n/a	n/a	1.90	113.3
Ciocco, District of Columbia (3)	n/a	26	86.0	8	n/a	n/a	3.60	115.0
Ciocco, Baltimore Maryland, Rural, (3)	n/a	29.5	89.0	7	n/a	n/a	3.25	126.0
Ciocco, Georgia, Rural, (3)	n/a	32.5	79.0	7	n/a	n/a	2.65	111.0
Steinwachs, GMENAC, (4)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	106.2
Steinwachs, Maxicare, (4)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	105.0
Steinwachs, MediCenters, (4)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	76.7
Brown, Solo Practice, (5)	58.6	n/a	143.7	n/a	n/a	n/a	n/a	143.7
Reinhardt, Solo Practice (5)	60	n/a	183	n/a	n/a	n/a	n/a	183.0
Brown, Group Practice, (5)	62.4	n/a	164.1	n/a	n/a	n/a	n/a	164.1
Reinhardt, Group Practice, (5)	64	n/a	213	n/a	n/a	n/a	n/a	213.0
MEDCOM Benchmark (note 6)	n/a	32.2	108.1	n/a	18.2	n/a	3.30	108.1
BJACH HPG (note 7)	n/a	23.0	66.7	n/a	20.7	n/a	2.90	66.7

TABLE SIX

note 1. From Shouldice, 1991, page 197. Source: Robert Carlson, "Study Shows No HMO Stereotypes." Medical World News, 27 (5):129-130, March 10, 1986.

note 2. From Mainous, et. al. 1994, page 790. Mainous also reports that physicians work an additional average of 13 hours a week after normal regular office hours.

note 3. From Ciocco, 1943. Not include separately in the graph is the number of home visits. These visits are included in the total visits column.

note 4. From Steinwachs, et. al, 1986. Average number of weekly visits assumes a 52 week work year.

note 5. Reinhardts data is based on data from Medical Economics Continuing Survey, 1965 & 1967. Browns data is based on U.S Department of Health and Human Services, Health, United States, 1986.

note 6. The numbers provided are projections based on the MEDCOM Benchmark study.

note 7. Data source, MEPRS for fiscal year 1994.

Staffing Comparison. Like workload, staffing data is reported in various ways. One way is to report personnel on staff as a ratio. The ratios reported in the literature are not consistent. This is due to the different definition of "support personnel". Some ratios include marketing, bill collection, and other personnel that are not reflected in the reported BJACH ratio. Since all the references do not breakdown the type of support personnel, it makes it impossible to compare ratios across organizations. The current staffing ratios for BJACH are presented in table 7. The figures in the "actual" column represent those personnel present for duty within the hospital. The personnel in the authorized column represent those personnel the that may be hired. Due to the inconsistency of ratio reporting a sample of the results of the literature staffing research are presented in figures 7 through 9. This sample illustrates the difficulty in direct comparisons of information on staffing ratios between organizations. A direct comparison of the total number of support personnel to physician ratio of 3.86 : 1 in the BJACH HPG's would lead the reader to conclude that the HPGs are over-staffed. Closer examination of the data reveals the fallacy in a direct comparison. For instance, figure 7 reports pure ratios for organizations. The difficulty in this comparison is that these ratios do not present the specific type of professional.

Figure 8 is limited in comparison to the HPG since the figures are based on a group model HMO. The structure of the group model is significantly different than the structure of the HPGs. It is interesting note though that the 1.89 : 1 ratio reported in this presentation (Shouldice, 1991) for 10 to 15 physicians is close to the MEDCOM benchmark of 1.86 : 1 ratio for the HPGs.

Figure 9 shows specific types of individuals but is limited since the group consists of 7.6 physicians. Attempts to compare this data directly to the 13 physicians in the HPG

would require knowing the incremental input of each professional to the physician in order

to be useful.

Bayne-Jones Army Community Hospital
Health Practice Group Staffing Ratios

Position	Actual	Authorized	Actual	Authorized
Family Practice Physician	14	14	n/a	n/a
Nurse	1	4	1 : 14	1 : 3.5
Direct Care Provider	4	4	1 : 3.5	1 : 3.5
Para-Professional	22	28	1.57 : 1	2 : 1
Administrative Personnel	15	18	1.07 : 1	1.29 : 1
Total Number of Personnel in HPG	56	68	n/a	n/a
Total Number of Support Personnel (note)	42	54	3.0 : 1	3.86 : 1
Total Number of Support without Administrative.	27	36	1.9 : 1	2.57 : 1

TABLE SEVEN note: MEDCOM Benchmark is 1.86:1, total number of support personnel per physician. Ratios are current as of April 27, 1995.

Sample Aide to Physician Ratios

Source	Aide to Physician Ratio
Brown, 1970	1.54 : 1
Brown, 1975	1.92 : 1
Brown, 1978	2.25 : 1
Brown, 1980	1.89 : 1
Brown, 1982	2.04 : 1
Brown, 1984	1.83 : 1
Brown, 1985	1.74 : 1
Reinhardt, Solo Practice	1.81 : 1
Reinhardt, Group Practice	2.12 : 1
Steinwachs, 1986	4.10 : 1
GHAA, 1992	2.50 : 1
Humana, GHAA	6.00 : 1

FIGURE SEVEN

Mean Total Number of Non-physician Staff By Group Size

Number of Physicians	Average Number of Non-physician staff	Staff to Physician Ratio
3	8.3	2.67 : 1
4	10.6	2.65 : 1
5 - 6	13.6	2.47 : 1
7 - 9	17.9	2.23 : 1
10 - 15	23.6	1.89 : 1
16 - 25	38.1	1.86 : 1
26 - 49	85.2	2.27 : 1

FIGURE EIGHT
From Shouldice, 1991.

Sample Staffing of a Physician Group
(7.6 Physicians in Group)

Type of Professional	Number in Typical Group of 7.6 Physicians
Nurse practitioner, CNA, or Physician Assistant	1
Registered Nurse, LPN or Medical Assistant	5.6
X-ray or Lab Technicians	2.8
Record/Administrative clerk	3.7
Manager or Administrator	1.6
Other staff	4.3

FIGURE NINE
From Havlicek, 1990.
(Average total number of staff per physician is 2.5.)

The most useful data found in the literature is presented by Carlson, (1986). His study concentrated on staff model HMOs which are similar in structure to the HPGs. Carlson recommends that the organization has 5.3 full time equivalent (FTE) staff per physician or 3.0 non physician staff per 1,000 enrollees. He further recommends that organization have; 1.35 FTE business and clerical staff per physician, 0.13 FTE physician assistants per physician, 0.50 FTE RN per physician, and 1.10 FTE non-RN nursing personnel per physician. He warns that these are guidelines only and may need adjustments based on age, sex or other demographical data. Based on the data presented, Carlson recommends that these figures be used as a starting point for developing individualized HMO operating standards. He proposes a plan of ongoing assessment and the use of a management information system to gather data on the health plans activities and performance data. This data is gathered to evaluate against the expected standards of

the HMO. This management information system must be efficient and provide timely data in order to manage each functional area.

Conclusions.

Comparing military treatment facility productivity and staffing figures to figures from the civilian sector requires a thorough knowledge of the differences between the two sectors. It also requires analysis of specific information. Until a standardized reporting system is developed benchmark data will be suspect.

III. ETHICAL CONSIDERATIONS

Administrators must recognize the ethical considerations of productivity improvement initiatives. The management of the hospital must be aware of the impact of any productivity improvement issues on patient care. Restrictive gate-keeping, the creation of financial incentives for physicians to limit care given to individual patients, seems unacceptable because of its morally significant effects (Sulmasy, 1992). A morally sound productivity monitoring system should be structured to monitor workload by honestly informing employees and assigning responsibility justly. It would encourage physicians to act in the interests of patients, would foster trust, and would recognize the great importance of equal treatment for all patients (Sulmasy, 1992). In this study, individual practitioners identity have been protected. The identification system used to gather workload data cannot be directly traced to any individual physician.

V. DISCUSSION.

Many approaches are used in the study of physician productivity. This study analyzed the time detractors of military physicians, the utilization of auxiliary personnel and compared BJACH productivity levels to civilian organizations. A weakness in this and all approaches to ascertaining productivity measures of physicians is the lack of specific information and the complexity of the health care system. Until information systems are developed that target specific utilization data and these systems are standardized across the healthcare spectrum, productivity research will have the same limitations.

What is the goal? The cost, access, quality triangle described by Fuchs places healthcare managers in a balancing act. It seems to increase access, cost will either rise or quality will decrease. The number of patient visits used to measure physician productivity

in this study is only one aspect of the delivery of healthcare. To reach a defined goal additional factors must be weighed.

VI. RECOMMENDATIONS AND CONCLUSIONS.

I recommend that the commander use individual family practice physician run charts and a plot of each family practice physician's utilization of support personnel (as presented in figure 6) to measure and improve physician productivity. A sample run chart is included in the appendix.

The purpose for recommending the run chart is to incorporate the current CQI philosophy into productivity improvements. The goal to increase productivity should be delegated to each physician. Physicians should be empowered and assisted in searching for ways to increase their productivity. The run charts will assist in tracking these improvements. Run charts track common cause variation and identify special cause variations. Training in the factors that contribute to the common cause variations in the number of patients that could possible be seen will increase quality and ultimately increase productivity. Changes to the delivery processes can be monitored to see if the changes increased or decreased productivity levels. Knowledge of special cause variations would prevent drastic system changes often taken to increase productivity levels.

The run charts should be coupled with the analysis of total time inputs to the number of visits per hour of physician time. This chart may be produced monthly by the hospital resource management division. This chart will allow the commander to identify specific levels of productivity of family practice physicians. The commander or department chief may then focus training efforts on individuals that have lower productivity levels. With this chart the commander or department chief may inquire into the methods of the

most productive workers and share this information with other physicians to increase overall productivity.

Focusing on continuously improving quality seems the best approach when considering the cost, access, quality triangle. Improvements in quality may not necessarily mean an increase in time utilization (therefore a decrease in access). Improvements are not limited to quality. Improvements in each corner of the triangle may be made and thus improve the entire system.

I do not recommend comparing the productivity levels of family practice physicians at BJACH to outside organizations. I also do not recommend setting a specific macro number goal of the number of patients to be seen. I believe this MBO approach to improving productivity levels is counter productive.

An advantage of implementing the run charts and auxiliary personnel productivity analysis is that it provides the statistical basis in justifying staff levels as required in the MEDCOM benchmark study. Mr. Harben (1995) stated that "positions that do not have a statistically justified standard by the end of fiscal year (FY) 1995 may be eliminated" These measures would enable the commander to statistically justify staffing levels.

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Physician Thirteen
Family Practice, HPG
Meprs Data

Average Monthly Total Visits, Mar 94 - Sep 94
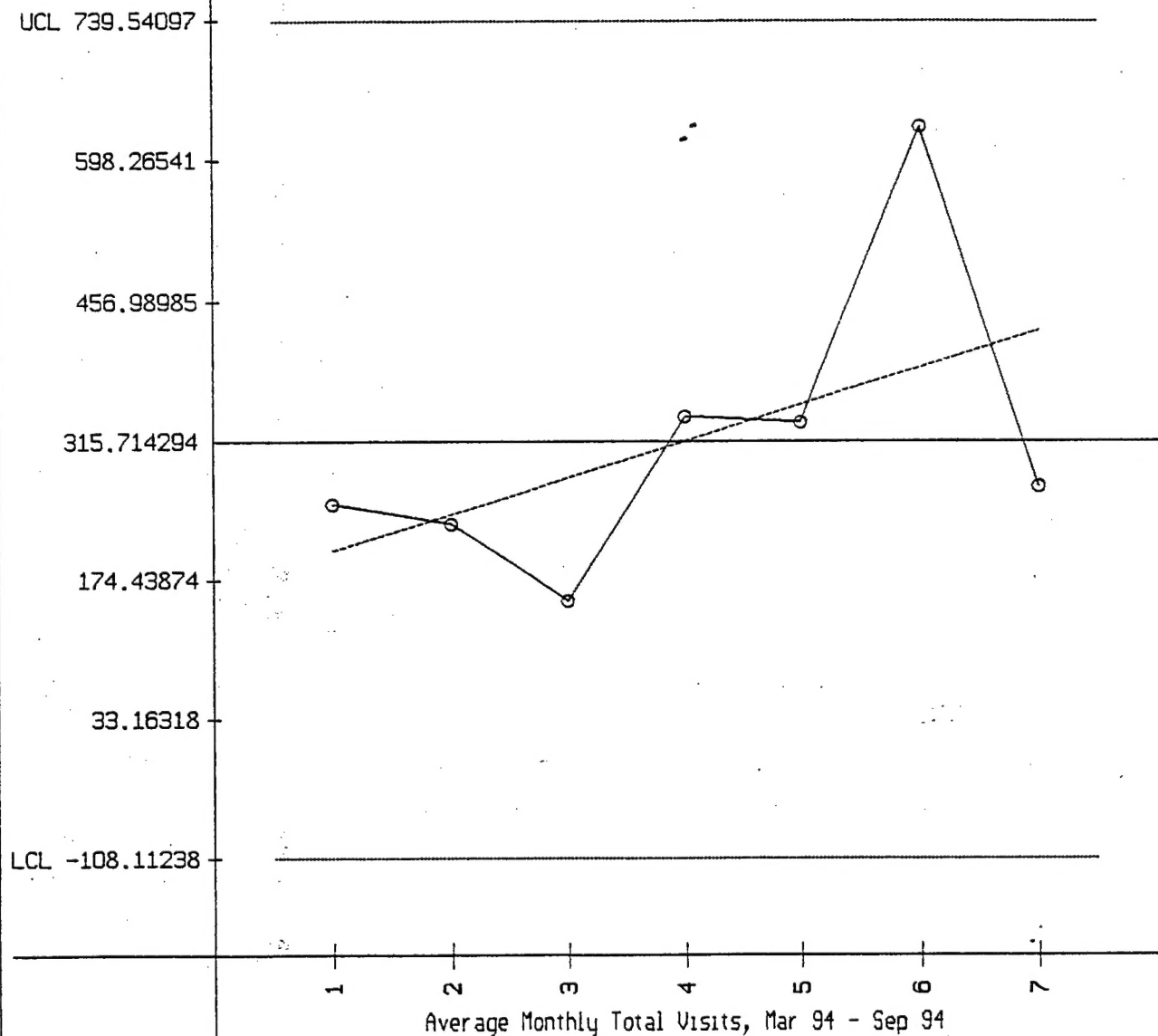
Regression Formula : Y = 167.14 + 37.14T Calculated from 1 to 7		
R Sq : 0.272141	F : 2.243350	t : 1.497782
sigma(n) : 142.399551	sigma(n-1) : 153.809097	Rel Var : 0.487178
Mean : 315.714294	Median : 269.000000	Skewness : 0.911148
Min : 152.000000	Max : 633.000000	Range : 481.000000
Center : 315.714294	LCL : -108.112381	UCL : 739.540955
Center Line : Mean	Limits : TABLE	File : physthirt
Stats : 1 to 7	Display : 1 to 7	Limits : 1 to 7